

A NEW SPECIES OF *TILAPIA* (PISCES, CICHLIDAE) IN THE ZAMBIAN ZAÏRE SYSTEM

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SYNOPSIS

A new species of the cichlid genus *Tilapia* A. Smith, 1840, is described from the Luongo River, a tributary of the Luapula in northern Zambia. It is assigned to the subgenus *Tilapia*. Compared to its near relative, *T. sparrmanii*, the new species is more elongate, with higher modal number of vertebrae (28, cf. 27) and a slightly longer caudal peduncle and has relatively shorter pectoral fins, features suggesting adaptation to flowing waters. The new species also appears to exhibit sexual dichromatism in the dorsal fin, an unusual feature in substrate-spawning *Tilapia*.

INTRODUCTION

THE new *Tilapia* described herein was collected by Dr Eugene K. Balon* while he was stationed at the Central Fisheries Research Institute (UNDP/FAO), Chilanga, Zambia, in 1970. Fish samples were taken in the Luongo River as part of Dr Balon's stock and production assessment programme for Lake Mweru and its drainage area. Analysis of the Luongo fish collections is continuing; a complete taxonomic and zoogeographic survey of the fish fauna will be published later.

The Luongo River is an eastern head-water stream of the Zaïre basin and enters the Luapula River about 20 km upstream from Johnston Falls. On the Luongo about 20 km upstream from its mouth Musonde Falls may have historically formed a barrier to upstream movement of some fish species. Recently a dam was built in the vicinity of Musonde Falls, completely isolating upstream areas. The new *Tilapia* was collected at two localities above Musonde Falls: (a) Nsenga (or Insenga) stream, a shallow, clear forest stream, 2-6 m wide with banks overgrown with brush, (b) Luongo River mainstream, a sluggish, turbid stream 18-20 m wide, 0.5-4 m deep, in open savannah with a deep, grassy ravine.

ABBREVIATIONS AND MEASUREMENTS

BMNH = British Museum (Natural History)

ROM = Royal Ontario Museum

SL = Standard length

The upper jaw is measured from the anterior point of the upper lip to the posterior end of the maxilla, the lower from the anterior point of the lower lip to the posterior end of the jaw, here the position of the retroarticular.

The preorbital bone is measured from the middle of its orbital rim along a line continuing the radius of the eye at that point.

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The last ray of the dorsal and anal fins is counted as one if it is separate from the penultimate at its base, even if it is smaller than the penultimate. A simple ray fused basally to the penultimate is not counted.

Tilapia baloni n. sp.

HOLOTYPE. ROM 28120: male, 136+30 mm, Nsenga stream, tributary of Upper Luongo.

PARATYPES. ROM 28120: 5 males, 86+23.5 to 114+28 mm, 6 females, 83+22 to 106+25.5 mm and a juvenile of 50+c, same field data as holotype.

ROM 28071: 3 males, 90+26.5 to 113+29.5 mm from Luongo River above Musonde Falls.

BMNH 1974.4.23.1: male, 138+36.5 mm from Luongo River above Musonde Falls (formerly ROM 28071).

BMNH 1974.4.23.2-4: female, 101+27 mm and 2 males, 100+26 and 85.5+22 mm from Nsenga stream (formerly ROM 28120).

DESCRIPTION. Meristic characters from holotype and all paratypes, proportions from holotype and 6 male and 5 female paratypes of 82.5-138 mm SL.

Proportions as % SL. Depth of body 36.5-41.7 (over 40.5 in only 2); length of head 30.4-32.0; length of pectoral fin 23.0-29.0 (over 28 in only 2); length of caudal peduncle 13.3-17.2, 14 or more in all but 1 specimen (0.96-1.25 times its depth, less than 1.0 in only 2 specimens).

Proportions as % length of head. Length of snout 33.9-38.4; diameter of eye 24.6-29.0; depth of preorbital 18.0-21.6; interorbital width 33.0-36.6; length of upper jaw 29.5-34.6, of lower jaw 35.5-38.5.

Maxillary not extending to below eye. Teeth in 3-5 rows in upper jaw, 3 or 4 in lower, 40-50 in outer row of upper jaw. Outer teeth bicuspid with the main cusp obliquely or rectangularly truncate; inner tricuspid with subequal cusps.

Gill-rakers on first arch (1-2)+1+(8-10, usually 8 or 9), short, those near the joint often bluntly bifid. Microbranchiospines present on outer sides of 2nd, 3rd and 4th arches.

Lower pharyngeal bone (Fig. 2) with a median length of 24.3-29.4% length of head, and width 31.4-36.3%, with short blade, 0.55-0.63 length of toothed area; teeth slender, the posterior bicuspid, the anterior kukri-shaped.

Scales on cheek in 3 horizontal rows; in lateral line series 29 or 30, between origin of dorsal and lateral line $3\frac{1}{2}$ or (usually) 4; around caudal peduncle 16. Circuli granular, mostly in a roman pattern but occasionally a few gothic.

Dorsal XIV 10 (f.2), XV 9 (f.1), XIV 11 (f.1), XV 10 (f.16) or XV 11 (f.2); last spine 14.5-17.8% SL, soft rays not greatly prolonged.

Anal III 9, third spine 14-15% SL.

Pelvics not quite reaching vent. Caudal truncate with angular or rounded corners, scaly only at the base and not densely.

Vertebrae 27 (f.3), 28 (f.17) or 29 (f.1).

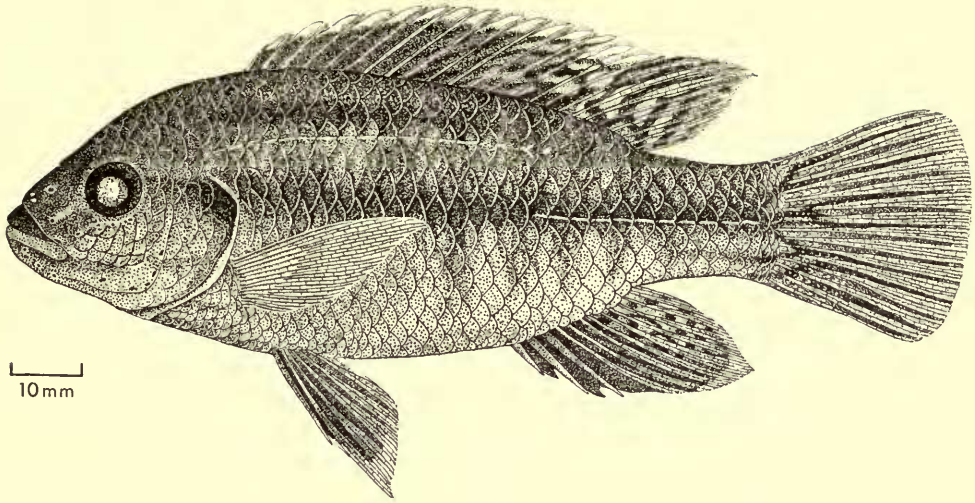


FIG. 1. *Tilapia baloni*, holotype.

Genital papilla of male conical or bluntly bifid, of female a short pigmented tube with scalloped rim. Loose ovarian eggs with long diameter about 1.9 mm in a fish of 100.5 mm.

Intestine in a specimen of SL 95 mm a little over 3 times SL, this and the stomach containing fine dark debris including parts of vascular plants, sparse fragments of filamentous algae and some desmids.

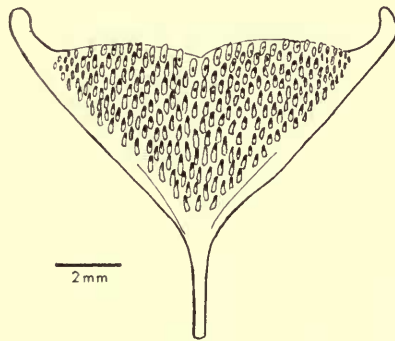


FIG. 2. Lower pharyngeal bone of *Tilapia baloni*, holotype.

Colour (from colour photographs taken by Dr Balon from recently killed fishes). Snout, top of head and dorsum dark blue-green, nearly black in adult male; flanks more diffuse green with 9 or 10 dark vertical bars and 2 horizontal bands present or absent (present in all preserved fish); scales of lower half of flanks and caudal peduncle each with a dark spot either centrally or at base. In the larger male main part of operculum and flanks around, below and behind pectoral crimson; fainter indications of same colour in other males.

Spinous dorsal dusky with vague paler spots and a submarginal black band ; soft dorsal proximally with spots or a dark reticulum with light interstices, distally with dark streaks between the rays ; a tilapia-mark on the dorsal fin in all specimens. In males dorsal lappets whitish with a pinkish tinge ; upper edge of soft dorsal and postero-dorsal corner of caudal the same colour. In females lappets dark or dusky, but soft dorsal and corner of caudal sometimes with narrow pale edge.

Anal dusky, with or without a pale tip. Pelvics dusky, pectoral transparent. Caudal with horizontal dark streaks between the rays.

T. baloni is so far known only from the Luongo River above Musonde Falls. A search through the British Museum and University of Michigan collections of *T. sparrmanii* from the Luapula basin and the Bangweulu Region revealed no overlooked specimens of the new species and none was encountered during the survey of the Kafue Flats in which one of us (D. J. S.) took part in 1969/70. We have both examined catches in the Mweru basin without finding it.

Dr Balon informs us that there is topographical and geological evidence that the upper Luongo once drained to the Kalungwishi, an eastern tributary of Lake Mweru. Some headwater streams of the Kalungwishi River rise in the swamps of the Kawambwe plateau, whose waters also feed the Luongo. The fish fauna of the upper Kalungwishi is not well known.

(The 'undescribed species from the Lake Mweru area' related to *T. sparrmanii* mentioned by Thys (1968 : 369) was *T. ruweti* and not *T. baloni*.)

AFFINITIES. *T. baloni* most resembles *T. sparrmanii* A. Smith, within whose general area of distribution it is found, but *T. baloni* is a more attenuate fish with a more acute head. The different shape of the body is expressed in the lower ratio of depth to length and the shape of the caudal peduncle as well as the number of vertebrae (Table 1). There is also a higher modal number of scales, but since this is true not only of the lateral line series but also the number between lateral line and origin of dorsal fin and rows on the cheek it may not be related to the presence of an additional metamere, the basic difference being the smaller size of the scales. The pectoral fin is usually relatively shorter, a feature which with the slender form probably indicates a stronger swimmer, with less use of the pectorals as paddles and balancers and more use of the tail for propulsion. At the sizes of our examples some individuals of *T. sparrmanii* have an additional row of teeth, but this is not constant. The long intestine and its contents in the one specimen examined do not suggest a sharp difference in feeding habits between this and *T. sparrmanii*. Duerre (1969) found a preponderance of periphyton in the diet of the latter in the upper Zambezi, with organic debris an important supplement.

The two species differ also in colour. In *T. sparrmanii* the red colour on the flanks takes the form of red edges to the otherwise green scales around and behind the pectoral. In the biggest photographed (male) *T. baloni* it is a red flush involving the greater part of the operculum and the abdominal region at and below the level of the pectoral nearly to the ventral surface. It is more metallic in appearance than the red of the flanks characteristic of most species assigned to subgenus *Coptodon*. In the latter and *T. sparrmanii* males and females are coloured alike in body and fins.

TABLE I

Contrasts between *T. baloni* (22 specimens, 1 of 50 mm, 21 of 82–136 mm in SL) and *T. sparrmanii* (proportions in 16 specimens 82–126 mm SL, meristic characters also in others) from the Luapula basin and Bangweulu region

	<i>T. sparrmanii</i>	<i>T. baloni</i>
Depth of body (% SL)	39.5–50.0 (only 2 < 41.5)	36.5–41.7 (only 2 > 40.5)
Length of pectoral (% SL)	24.0–32.5	23.0–29.0
23.0–27.9	f. 4	f. 20
28.0–29.0	2	2
29.1–32.5	10	0
Length of caudal peduncle (% SL) divided by its depth	12.0–15.3 0.66–0.99	13.3–17.2 0.96–1.25 (only 2 < 1.0)
Scales : 1.l. series		
26	f. 2	f. 0
27	18	0
28	17	0
29	5	15½
30	2	6½
D-1.l.		
3	f. 19	f. 0
3½	24	6
4	5	15
4½	1	1
cheek rows		
2	f. 37	f. 0
3	7	22
Dorsal spines XIII	f. 2	f. 0
XIV	38	3
XV	9	19
Total dorsal rays		
23	f. 1	0
24	11	3
25	30	17
26	7	2
Modal formula	XIV II	XV 10
Vertebrae		
26	f. 2	f. 0
27	22	3
28	8	17
29	0	1

T. ruweti (Poll & Thys van den Audenaerde) is also found on the Kawambwa plateau in waters including tributaries of the Luongo (specimens in Chilanga Fisheries Research Station, examined by E. T., others collected by Dr Balon examined by D. J. S.). Its modal dorsal formula is XIV 10, nearly approached by XIV 11, and the modal number of vertebrae, as in *T. sparrmanii*, is 27. Its caudal fin is rounded. It has not been recorded at sizes greater than 80 mm SL and is more slender than *T. baloni*, with an even shorter pectoral fin. Distinctive elements of the colour pattern are the tricolour band edging the dorsal fin and the light blue and purple-red spots on soft dorsal and caudal fins. No sexual dichromatism has been reported.

T. sparrmanii is present below Musonde Falls, but has not been caught in the Upper Luongo. *T. ruweti* is sympatric with *T. baloni* in the Upper Luongo, just as elsewhere (e.g. in the Mweru lagoons) it is caught together with *T. sparrmanii*.

The fact that to this extent *T. baloni* occupies the niche elsewhere belonging to *T. sparrmanii* suggests that it is either a vicariating species or a subspecies of the latter. We have no evidence so far that the differences are less than specific, and the probability that there are colour and size differences between the sexes in *T. baloni* is further support for its specific status. Although *T. sparrmanii* is reported from rivers, it is not a fish of the main streams, but occupies lagoons and backwaters rich in vegetation. *T. baloni* is probably derived from *T. sparrmanii* or a *sparrmanii*-like common ancestor in response to life in a river-bed of steeper gradient than that favourable to *T. sparrmanii*, with all that it means in terms of locomotion and food.

Sexual dichromatism in the dorsal fin of *T. baloni* is a significant difference between it and other species of *Tilapia* (as distinct from *Sarotherodon*) and it suggests that the sexes may differ more in their courtship roles than is usual in *Tilapia*.

We place the new species in subgenus *Tilapia*, which includes the two species with which we have compared it (as well as *T. guinasana* in the opinion of one of us, E. T.) because of the bicuspid pharyngeal teeth (tricuspid in most species of subgenus *Coptodon*), low total numbers of dorsal rays and the relatively narrow preorbital bone. But there are two features in which *T. baloni* resembles the species included in *Coptodon* – the modal number of vertebrae, also 28 in *Coptodon*, and the presence of 3 rows of scales on the cheek. The species, *T. (Coptodon) rendalli* Boulenger, that is found in the same geographical area as *T. baloni* and *T. sparrmanii* is the one most unlike these species, having a modal 29 vertebrae, and is more advanced in some other ways, and this is another reason for relating *T. baloni* to the species of *T. (Tilapia)*.

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